PAMPHLET 1286
NOVEMBER 1966

# GRS ELECTRIC SWITCHMAN

## INSTALLATION - OPERATION

## MAINTENANCE

SUPERSEDES HANDBOOK 61

GENERAL RAILWAY SIGNAL COMPANY
A UNIT OF GENERAL SIGNAL CORPORATION
ROCHESTER NY CHICAGO IL MONTREAL PQ NEW YORK NY OAKLAND CA ST LOUIS MO

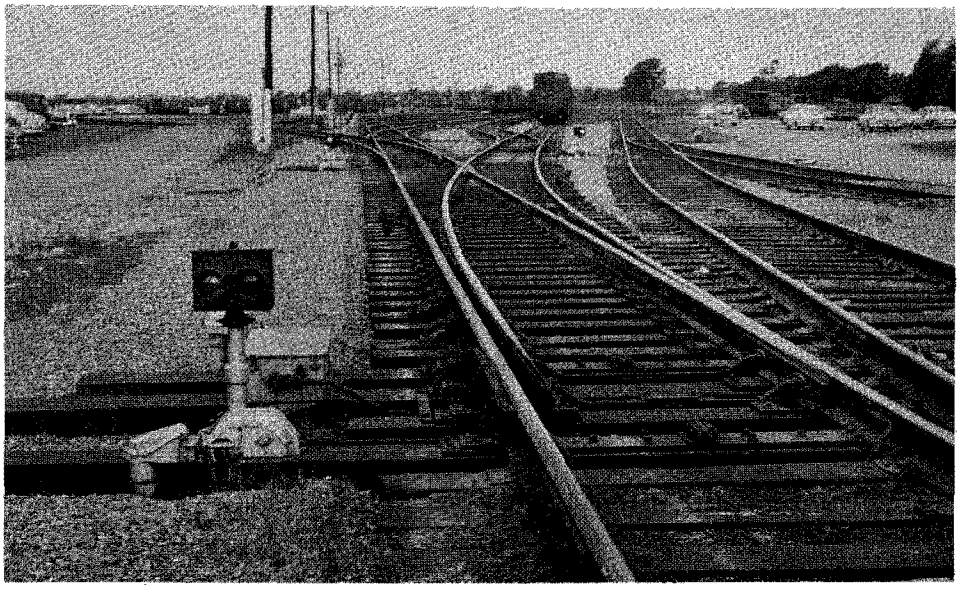

Figure 1. Typical left-hand Electric Switchman layout in receiving yard, including switch circuit controller and switch signal.

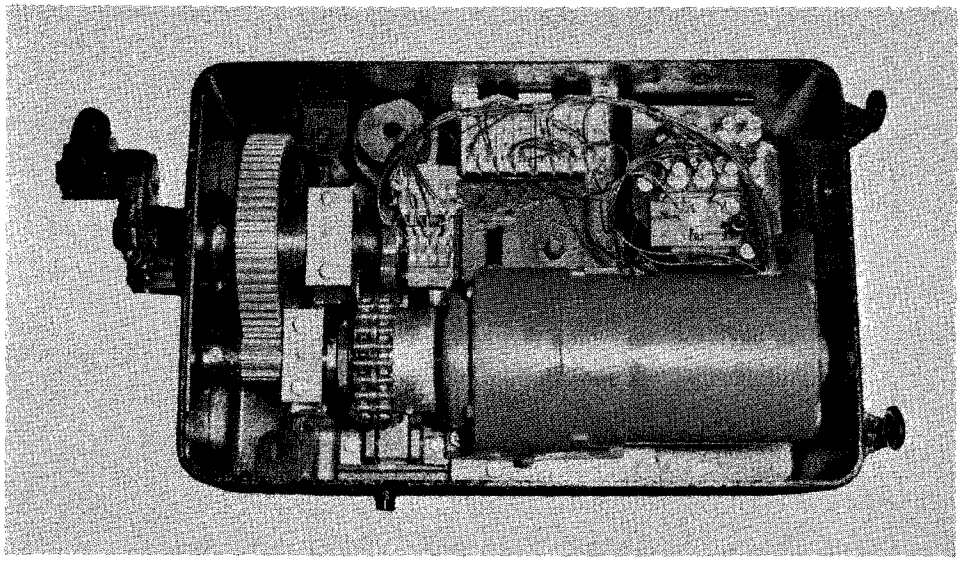

Figure 2. All parts are readily accessible for inspection and maintenance.


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# CHANGE NOTIFICATION

From

GENERAL RAILWAY SIGNAL COMPANY
A UNIT OF GENERAL SIGNAL CORPORATION
ROCHESTER NEW YORK 14602

GRS Electric
Switchman 59450-2
Pamphlet 1286

REVISE PAMPHLET 1286 AS FOLLOWS:

Page 7 — Under 4.a., change "90 volts" to"100 volts".

Page 10 — Under "Lubrication", item 4, change "SAE20 oil" to "SAE10 oil" and add second sentence: "Maintain the level of SAE10 oil in the oil resevoir, Figure 4, to ensure constant lubrication of the locking roller."

A802-98 A2431 May 1969

## GENERAL DESCRIPTION

The GRS Electric Switchman is a simplified, compact electric switch machine which is used in place of hand-throw switch stands in flat yards, receiving and departure yards, and similar noninterlocked service, including operation of derails and blue-flagging devices. It can be used with either a trailable or nontrailable switch layout.

The Switchman, which operates in less than two seconds, uses 115-volt, 60-cycle, single-phase power for both control and operation. It is instantly reversible at any point in its stroke. When used with a detector track circuit, it automatically completes a stroke in progress when the detector track becomes occupied.

Detector track circuits are recommended. They should extend far enough in advance of the switch points to permit complete switch movement before the car wheels reach the points.

A GRS switch circuit controller checks the switch point position. Suitable circuit connections through the controller and the correspondence contacts in the switch machine provide switch position indication and switch signal control.

For a trailable layout, it is recommended that the circuits be arranged so that when the switch is trailed past center in either direction the Switchman drives the points to the trailed position.

## OPERATION

### Power Operation

Two interlocked contactors, Figure 3, control the operation of the Electric Switchman. The initiation of a normal or reverse control applies energy to the corresponding contactor. The contactor picks up to energize the motor and remains up during operation.

The motor starting and running windings are connected in parallel for starting. A capacitor (located under the terminal board and connected in series with the starting winding) produces the required phase shift to start armature rotation. When the motor arrives at full speed, a built-in centrifugal switch opens the starting winding, and the motor continues to operate on its running winding alone. Normal motor operating current, after the starting surge, is 7 to 9 amperes, depending on the load.

The motor drives the pinion shaft through an internal gear-head reduction and overload friction clutch. The pinion gear drives the main gear on the output shaft. The operating crank, fastened to the external projection of the output shaft, moves the throw rod. The normal throw rod stroke is 5-1/2 inches.

The cutoff cams, attached to the output shaft, operate the normal and reverse limit switches. At the end of the stroke, the cutoff cam operates the associated limit switch. Operation of the limit switch opens the contactor control circuit, and closes the correspondence contact. This cuts off motor energy and initiates an indication that the Switchman has completed its stroke.

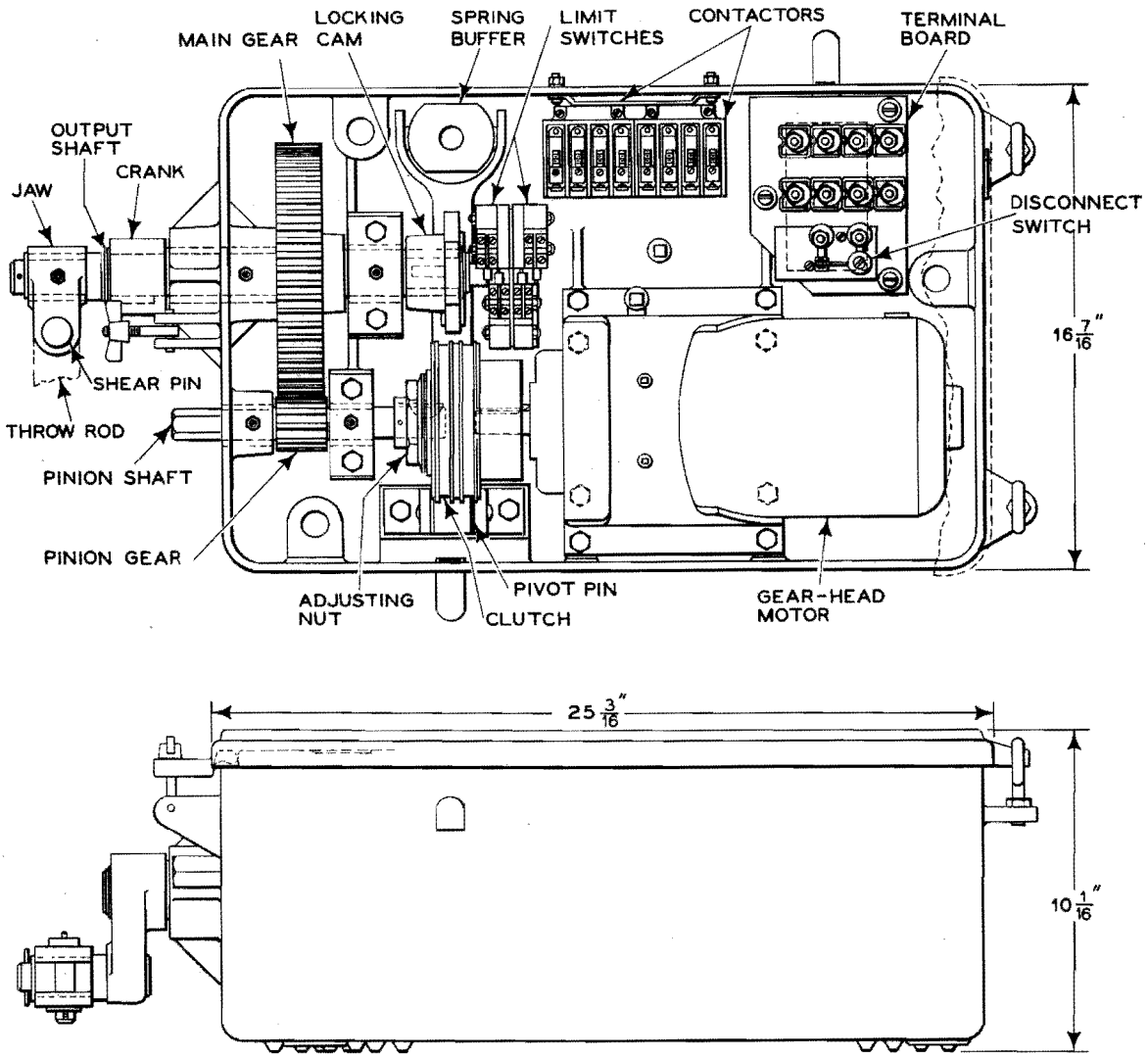


Figure 3. Internal arrangement and external dimensions of the Electric Switchman.

The locking cam, also attached to the output shaft, and the spring buffer, Figure 4, function together to hold the Switchman at each end of the stroke. The cam-actuated spring buffer dips down and returns to its normal position at the end of the stroke. At the end of the stroke, the spring buffer is momentarily driven down again and then comes up to ensure that the locking roller is in the bottom of the locking slot in the locking cam. The spring buffer holds the locking roller securely in the locking slot.

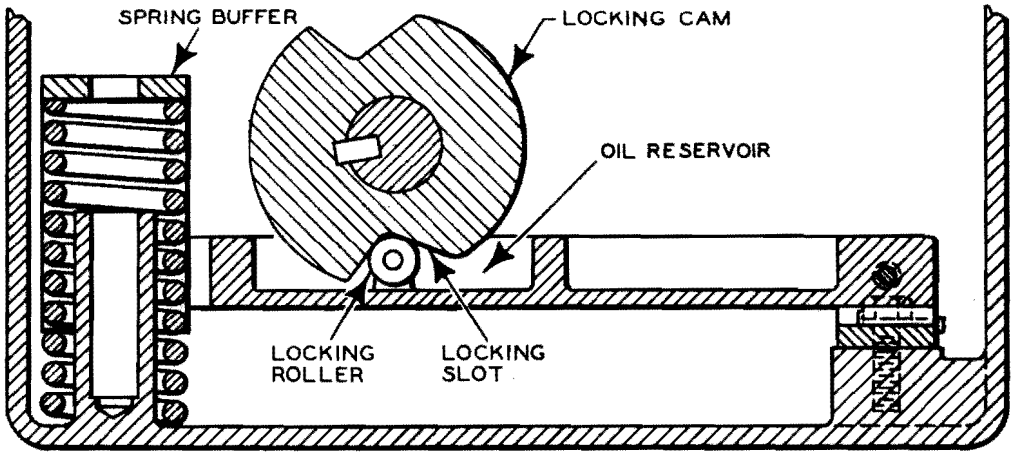


Figure 4. Locking arrangement.

## Hand Operation

CAUTION: Open the motor disconnect switch, located on the terminal board, before attempting to hand operate the Electric Switchman.

With the disconnect switch open, rotate the pinion shaft with the hand crank, Figure 5, or with other suitable tool. The external projection of the pinion shaft is a 7/8-inch hex. Counterclockwise rotation of the shaft closes the left-hand point; clockwise rotation closes the right-hand point.

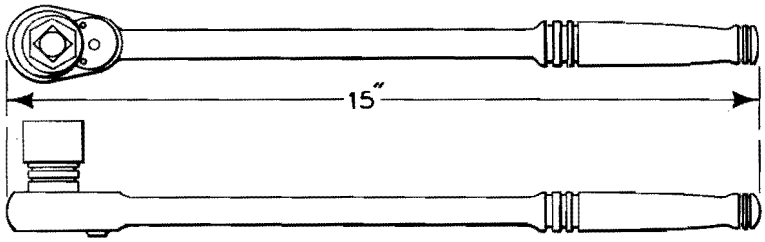


Figure 5. Hand crank with 7/8" hex socket, GRS Catalog No. A85-860.

# INSTALLATION

## General

Figures 6 and 7 are typical switch layouts which may be varied in accordance with individual railroad standards. The Switchman can be used in either a left-hand or right-hand layout.

In the nontrailable layout, Figure 6, the crank on the Switchman is connected by the throw rod directly to the switch adjusting basket on the No. 1 rod. In the trailable layout, Figure 7, a spring head rod replaces the adjusting bracket.

Detector track circuits should be arranged (1) to prevent switch operation when the track circuit is occupied, and (2) to permit the Switchman to complete a stroke in progress if the track circuit becomes occupied.

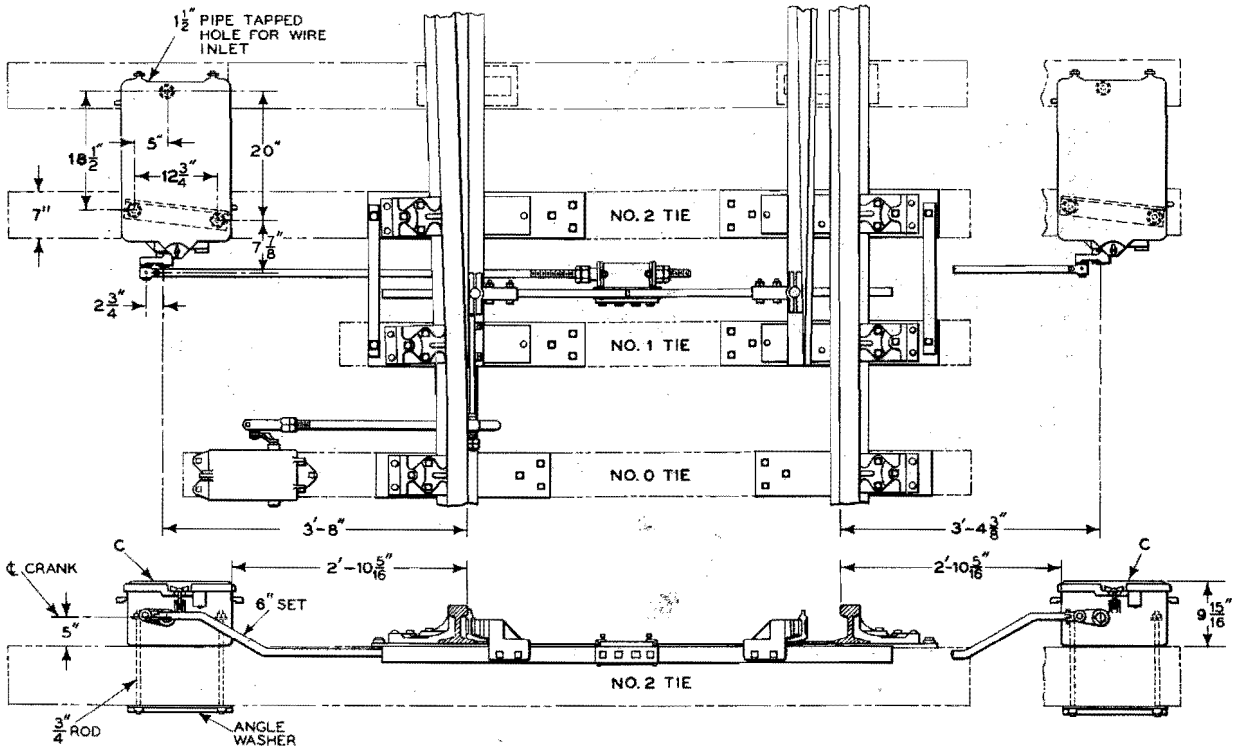


Figure 6. Typical nontrailable layout.

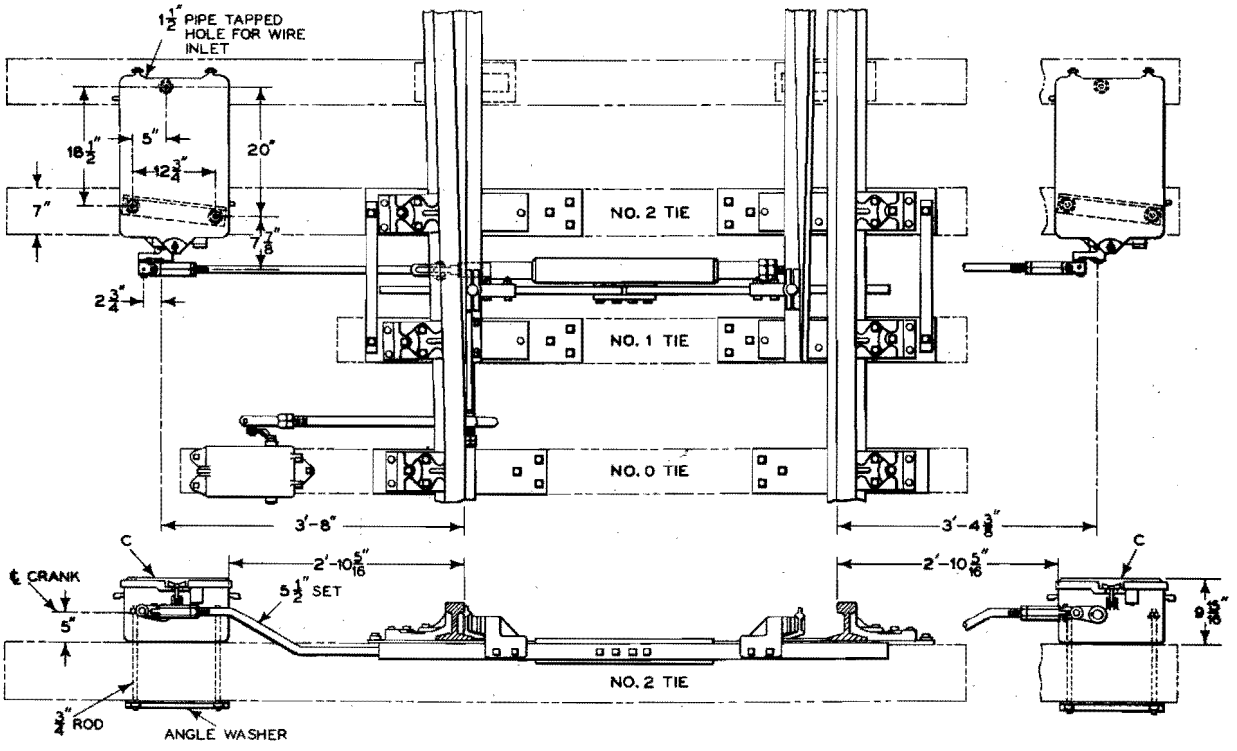


Figure 7. Typical trailable layout.

## Procedures

1. Locate and drill three mounting holes in the two long ties. No tie framing is required. Locate the mounting holes so that the Switchman will be parallel to, and the proper distance from, the gauge line, and that the center line of the throw rod will coincide with the center line of the switch basket, or spring head rod.

2. Securely fasten the Switchman to the drilled ties with the 3/4-inch rods, angle washer, O.G. washer, lock washers, and nuts. Draw the nuts up tightly so that the projections on the bottom of the case bite into the ties.

3. Fill the motor gear case to the level of the upper plug on the side of the motor. Use the Texaco-Regal Type PC oil supplied with the Switchman.

   CAUTION: Do not operate the Switchman without oil in the motor gear case.

4. Connect the field wires in accordance with your railroad plans or as shown in Figure 8, the connection diagram. The operational circuit is shown in Figure 9.

   a. Use energy wires of sufficient size so that with normal operating current (7 to 9 amperes) the voltage at the Switchman does not drop below 90 volts.

   b. As the NX115 wire is normally common for both the contactor circuit and motor circuit, the contactor energy and motor energy (115 volts, 60 cycles) must come from the same source. This energy arrangement requires two wires for the contactor circuit and two for the motor circuit. If separate energy sources are used, three wires are required for the control circuit. The number of wires for indications depends on the circuit used.

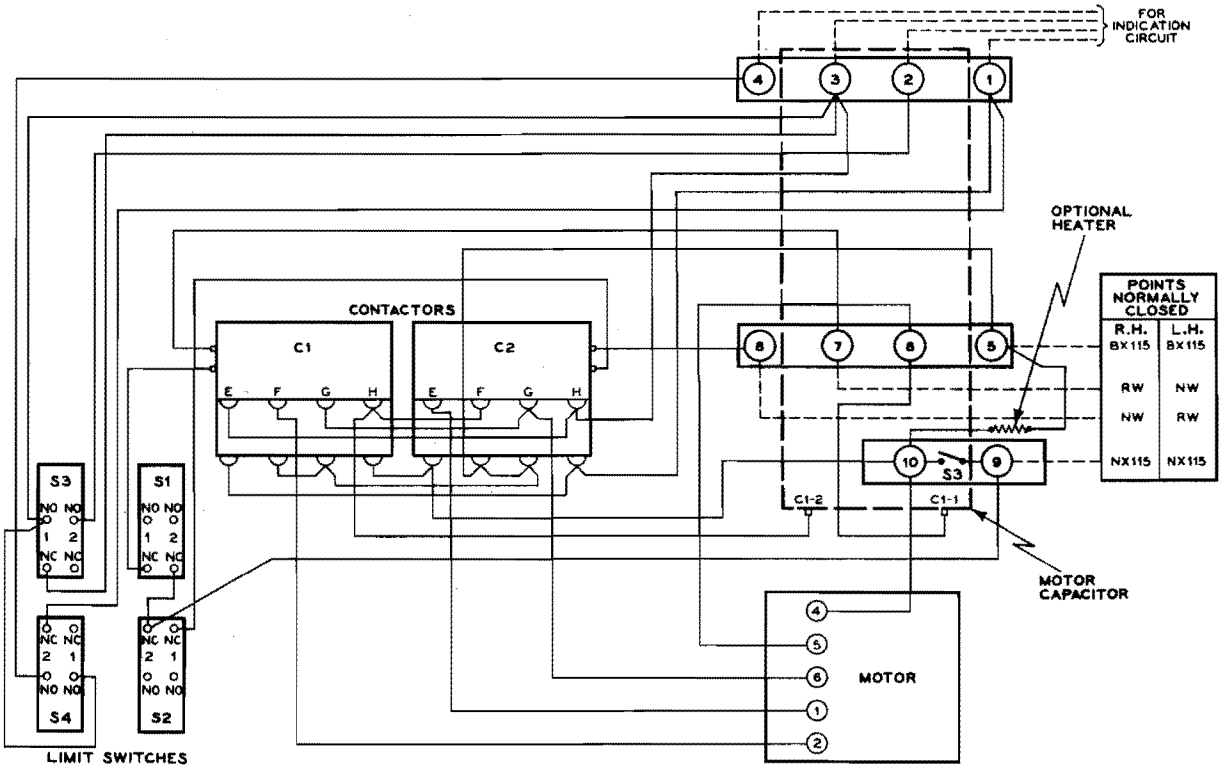


Figure 8. Connection diagram.

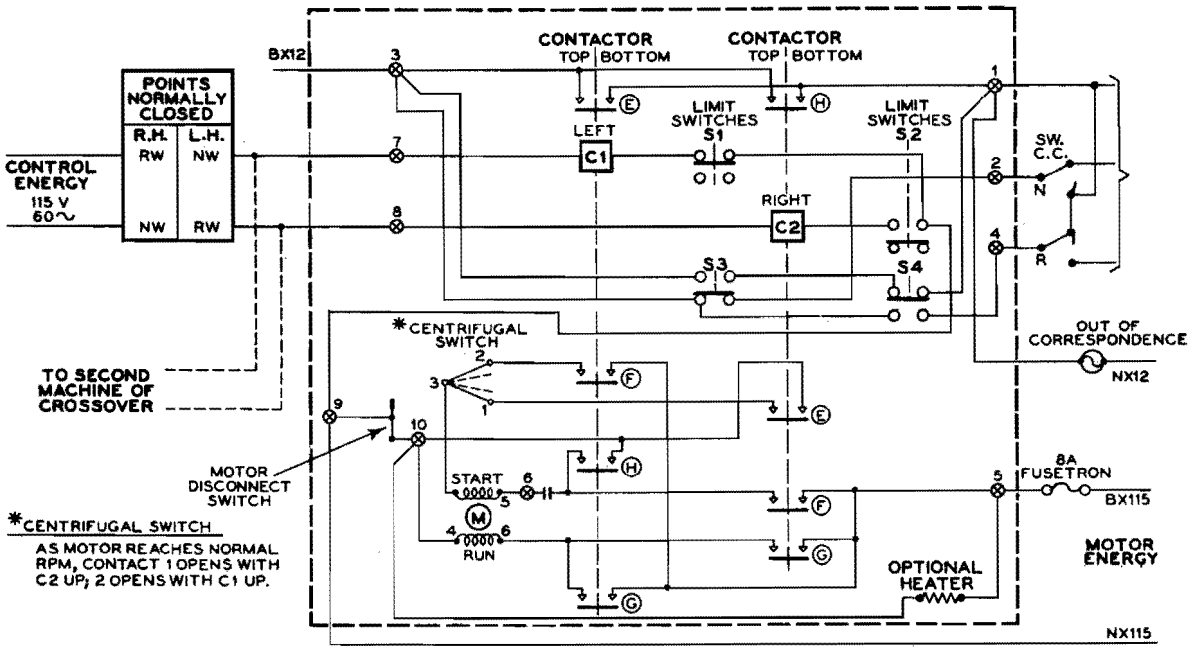


Figure 9. Operational circuit.

5. Proper operation of the limit switches depends upon the adjustment of the cutoff cams. If adjustment is required, loosen the cam locking screws and rotate the cam on the shaft to the correct position - see Figure 10.

   After the Switchman has been in service for a period of time, it may be necessary to readjust the cutoff cams to an even sooner cutoff. Overdriving the motor drives the locking cam into the locking roller with a force which causes the Switchman to rebound, thus reclosing the motor cutoff microswitch and causing the mechanism to pump. After readjustment, check that the locking roller is in the bottom of the locking slot.

6. Check the position of the operating crank on the shaft. With the switch point next to the Switchman closed, Figure 11, the square key between the crank and the shaft MUST BE on the top of the shaft.

   The crank is a slide fit on the shaft and is held in place by a snap ring. The snap-ring may be easily removed by use of GRS pliers, Dwg. No. 45794-9. Be sure to replace the crank on the shaft in the correct position.

7. For a nontrailable layout, connect the throw rod to the switch adjusting bracket on the No. 1 rod and to the crank on the Switchman.

   CAUTION: Before placing the jaw into the crank, check the jaw alignment to ensure that it will slide onto the crank in either the full normal or full reverse position with minimum upward force. If excessive upward force is required, set the rod in the field.

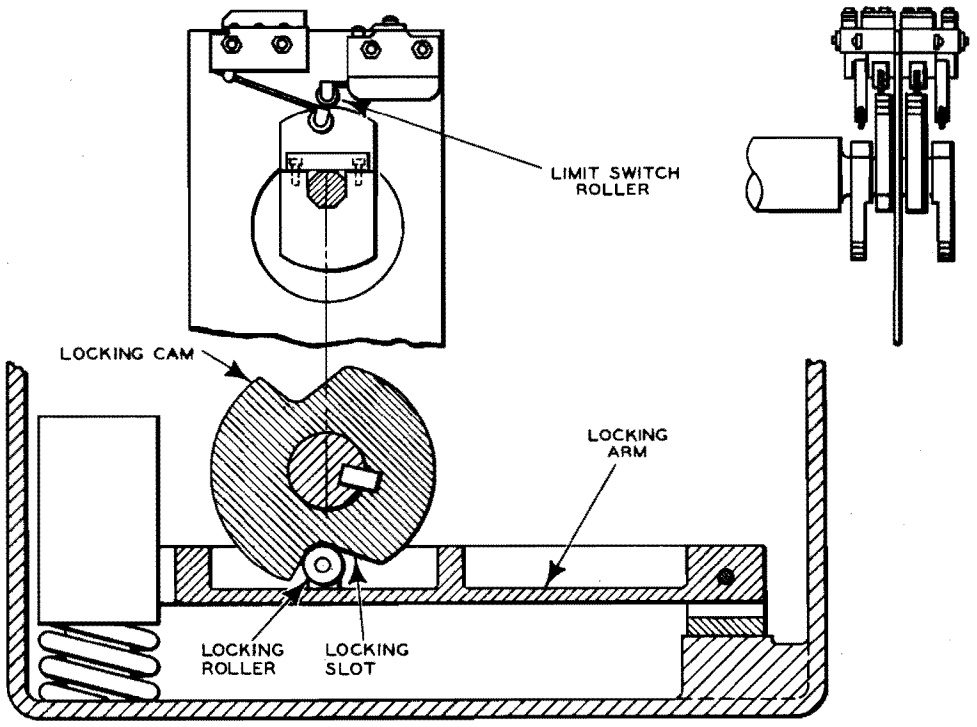


Figure 10. How to check adjustment of cutoff cams.

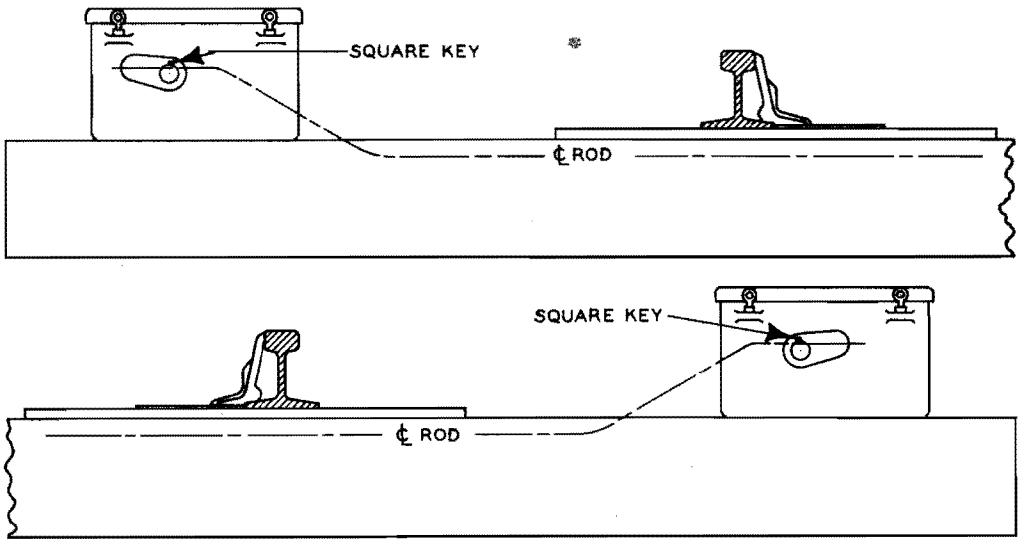


Figure 11. Location of the square key between crank and shaft.

With the Switchman in either full-locked position, adjust the throw rod at the basket so that the switch point closes on the stock rail as desired. Hand crank the Switchman to the opposite full-locked position and readjust the throw rod for this position.

8. For a trailable layout, crank the Switchman to either full-locked position, and connect the throw rod between the spring head rod (on the No. 1 rod) and the crank on the Switchman. Adjust the throw rod so that its overtravel in the spring head rod is about the same (at least 1/8 inch) in either the full normal or full reverse position.

9. Check that the switch positions correspond to the positions of the control lever, and that the correspondence contact on the associated limit switch is closed with the Switchman in the normal and reverse positions.

10. Disconnect the motor energy wire from terminal 5 and insert an a-c ammeter (0-15 ampere scale) between the wire and the terminal. Place an obstruction between the switch point and the stock rail and operate the switch against the obstruction. Read the motor current as the clutch slips - it should be between 9 and 11 amperes.

    To increase the slipping current, tighten the adjusting nut on the clutch, Figure 3. To decrease the current, loosen the nut.

11. If the optional 600-ohm heater is to be used (GRS Catalog No. A85-865), remove the screws and nuts that hold the contactors in the Switchman. Attach the heater assembly to the lower part of the contactor mounting plate and replace the entire assembly.

    Connect the heater wires to either terminals 5 and 9, or 5 and 10 — the latter arrangement permits heater energy to be removed when the disconnect switch is opened.

12. Install the switch circuit controller and connecting rod following standard railroad practice.

## MAINTENANCE

Establish a program for regular inspection, lubrication, and adjustment of the Electric Switchman. Monthly intervals are suggested. The number of switch operations and the operating conditions at the switch location will determine the need for more or less frequent maintenance.

### Lubrication

1. Motor gear case - keep the oil level at the upper filler plug. Use only Texaco-Regal Type PC. About every two years, drain the gear case and refill.

2. Bearings - lubricate each of the two bearings on the pinion shaft and the operating shaft — they have pressure fittings. Use an all-temperature grease, such as Mobilux No. 1.

3. Throw rod jaw - lubricate with the all-temperature grease through the pressure fitting.

4. Pivot pin and locking arm - apply a few drops of SAE 20 oil to the pin on which the locking arm pivots and to the edge of the locking cam.

5. Spur gear and pinion - apply a thin coat of adhesive grease (ball or roller bearing type) to the gear teeth.

## Adjustments

1. Cut-off cams - check that the adjustment is correct. If not, refer to item 5, page 8.

2. Limit switch arms - if accidentally bent, operate the Switchman to the full-locked position in which the limit switch should be operated. Straighten the arm so that the roller bears lightly on the cam edge. Check the position of the cutoff cam on the shaft. If adjustment is required, refer to item 5, page 8.

   Operate the Switchman several times, checking that both limit switches operate properly. If not, replace the switch and adjust the associated cutoff cam.

3. Clutch - measure the clutch slipping current as follows:

   a. Disconnect the motor energy wire from terminal 5 and insert an a-c ammeter (0-15 ampere scale) in series with the wire and terminal.

   b. Place an obstruction between a switch point and the stock rail.

   c. Operate the switch against the obstruction and read the current as the clutch slips. It should be between 9 and 11 amperes.

   d. To adjust the slipping current, tighten or loosen the adjusting nut on the clutch. Tightening the nut increases the slipping current; loosening the nut decreases the slipping current.

4. Throw rod - check the adjustments on the bracket at the No. 1 rod.

5. Wire connections - check that the terminal post nuts are tight.

## To Remove Motor

1. Open the disconnect switch on the terminal board.

2. Disconnect the motor wires - they are tagged..

3. Remove the four cap screws from the motor mounting plate.

4. Loosen the lock screw on the clutch collar and slide the clutch plate assembly away from the motor as far as possible.

5. Take hold of the back end of the motor and lift it in an arc up and out.

## To Install Motor

1. Lower the motor in an arc into the case - be sure to keep the wires out from under the motor.

2. Replace the four cap screws in the motor mounting plate.

3. Slide the clutch plate assembly into full engagement with the clutch housing on the motor shaft. Tighten the lock screw on the clutch collar.

4. Connect the motor wires to the terminal board.